Assessing and Managing Risks of Pesticides to Bees

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Agenda

1. **U.S. Bee Declines**
   - History
   - Associated factors
2. **National Strategy**
   - Goals and commitments
3. **Assessing Risks**
   - Tiered Process
   - Refining Methods
     - Non-*Apis* bees
4. **Mitigating Risks from Pesticides**
   - Varroacide Testing
   - Best Management Plans
   - Stakeholder Outreach
   - Acute risk mitigation policy
   - Managed pollinator protection plans
   - Recent label mitigation and path forward
   - Neonicotinoids

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Colony Collapse Disorder (CCD)

First reported in 2006 by commercial beekeepers

- Rapid loss of adult bees; few if any dead bees
- Queen and small retinue of attending bees
- Ample food reserve
- Developing young present

Coincided with release of NRC Report on the Status of Bees in North America

- Reported declines of managed honey bees (*Apis mellifera*) and some species of native non-*Apis* bees.

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Honey Bee Declines

National Agricultural Statistics Survey (NASS)

- Declines in managed honey bee colonies; peak of approximately 6 million colonies in 1947 to roughly 2.8 million in 2006 (USDA 2008).
- Change in survey methodology in mid-1980s.
- Varroa mite introduction (1987) followed by decline in managed colony numbers.
- Numbers have leveled off since 1996.
- As on 2018; 2.69 million colonies.

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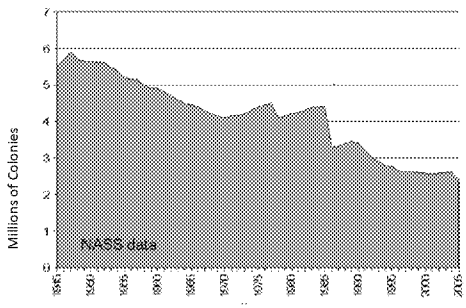
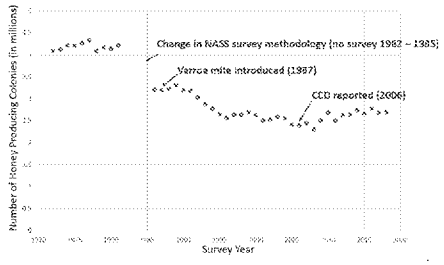




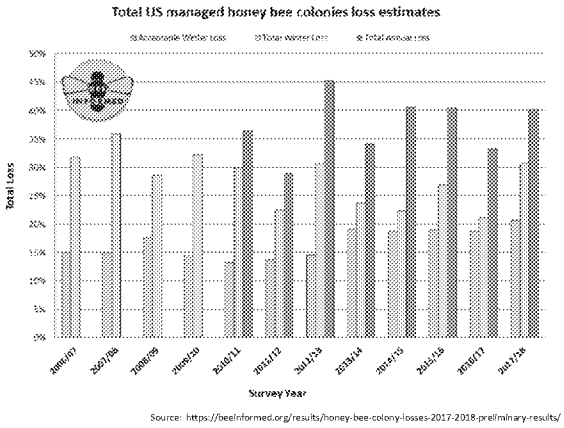
Status of Managed and Wild Bee Losses in the U.S.

Honey bees

- Avg. overwintering colony loss since 2008: 27.9%
- Overwintering loss (2017 – 2018): 30.7%
- Total annual loss: 40.1%
- CCD has accounted for relatively low percentage (<5%) of losses; however, 2017 – 2018, increased by 15%.

Wild bees (~3,500 spp. in North America)

- Populations of some species of wild bees are in decline
- Since 2017, several species of bees added to the Endangered Species List:
  - Yellow-faced bees
  - Rusty patched bumble bee



Source: https://beeinformed.org/results/honey-bee-colony-losses-2017-2018-preliminary-results/

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Factors Associated with Colony Losses

PATHOGENS/PARASITES

Nosema

Bacteria

Viruses

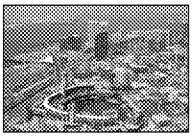
Fungi

Parasites

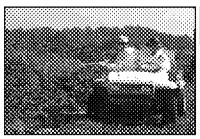
Other Insects

NUTRITION

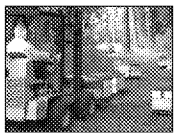
AGRICULTURAL PRACTICES



URBANIZATION



PESTICIDES



BEE MANAGEMENT PRACTICES

Source: USDA Agricultural Research Service

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NATIONAL STRATEGY

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Presidential Directive to Improve Pollinator Health

- In 2014, President Obama issued a memorandum calling on Federal agencies to increase and coordinate their efforts to improve bee health by developing an integrated strategy

- Also, that EPA shall engage State and Tribal environmental, agricultural, and wildlife agencies in the development of State and Tribal pollinator protection plans

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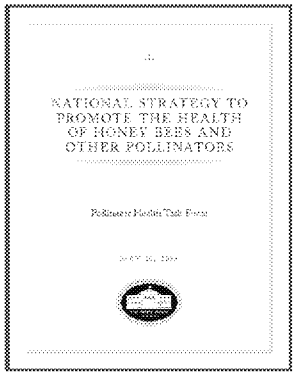
National Strategy to Promote the Health of Honey Bees and Other Pollinators

Strategy released in 2015 and incorporates and identifies:

- Commitments from each Federal agency to promote health of honey bees and other pollinators;
- Pollinator Research Action Plan (PRAP);
- Public Education Plan; and,
- Public/Private Partnerships (2016)



https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/Pollinator%20Health%20Strategy%202015.pdf

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National Strategy Overarching Goals

1. **Reduce honey bee overwintering losses to no more than 15% within 10 years;**
   - Compared to current 5-yr average rate of approximately 30%.

2. **Restore monarch butterfly populations to 225 million butterflies by 2020;**
   - Their historical average population size.

3. **Restore/enhance 7 million acres of land for pollinators over the next 5 years;**
   - Federal action and public/private partnerships.

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EPA Commitments

- Assess the effect of pesticides on bees and other pollinators;
- Seek to limit the use of products toxic to bees in crops with commercial pollination;
- Engage State and Tribal partners in the development of managed pollinator protection plans;
- Expedite review of registration applications for new products targeting pests (*e.g.*, mites) harmful to pollinators;
- Encourage the incorporation of pollinator protection and habitat planting activities into green infrastructure and Superfund projects; and,
- Enhance pollinator habitat at Federal facilities.

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ASSESSING THE EFFECT OF PESTICIDES ON BEES

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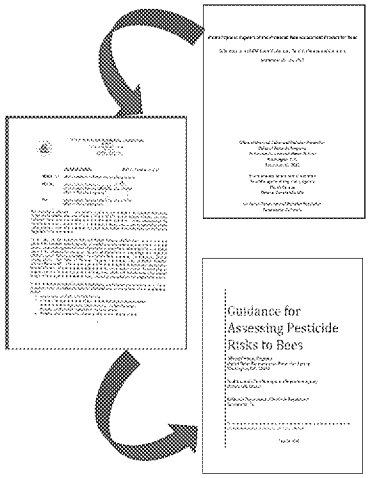
Assess the effect of pesticides on bees

- **2011: Interim Guidance on Honey Bee Data Requirements**
- **2012: Pollinator Risk Assessment Framework White Paper**
  - Developed in collaboration with Health Canada's Pest Management Regulatory Agency and the California Department of Pesticide Regulation.
- **2014: Final EPA Guidance on Risk Assessments for Pollinating Bees**
  - Harmonized guidance; served as template for Mexico and Australia.



https://www.epa.gov/sites/production/files/2014-06/documents/pollinator_risk_assessment_guidance_06_19_14.pdf

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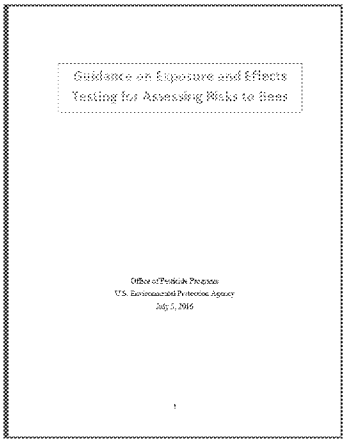
Assess the effect of pesticides on bees

2016 Guidance on Exposure and Effects Testing for Assessing Risks to Bees

- Tier 1
  - Adult acute contact/oral;
  - Adult chronic 10-day;
  - Larval acute; and,
  - Larval chronic 22-day
- Tier II
  - Semi-field (tunnel; feeding) Colony; and,
  - Residues in pollen/nectar.
- Tier III
  - Full-field Colony


Guidance on Exposure and Effects Testing for Assessing Risks to Bees

Office of Pesticide Programs
U.S. Environmental Protection Agency
July 5, 2016

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https://www.epa.gov/sites/production/files/2016-07/documents/guidance-exposure-effects-testing-assessing-risks-bees.pdf

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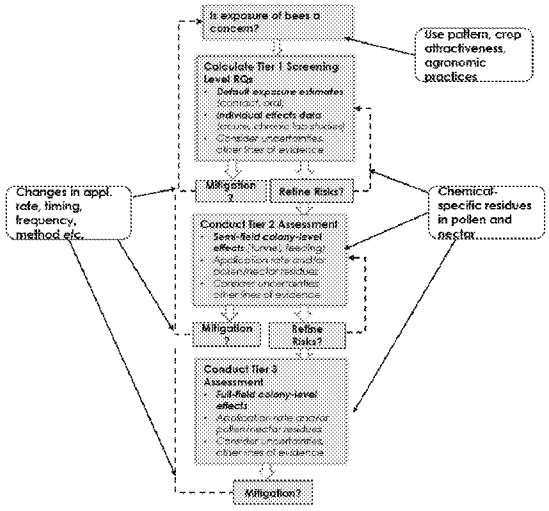
Tiered Risk Assessment Process

- Screening-level risk estimates based on Tier 1 acute and chronic laboratory studies with adult and larval bees.
- Higher-tier studies with honey bee colonies may be required pending the outcome of the Tier 1 analysis, whether risks can be mitigated, and risk manager need for additional refinement.



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Refining Test Methods

- EPA is working with its regulatory counterparts through the Organization for Economic Cooperation and Development (OECD) and with researchers internationally through the International Commission on Plant-Pollinator Relationships (ICP-PR) to ensure the development of suitable methods for evaluating the effects of pesticides on both honey bees and non-*Apis* bees.
- OPP is engaged in a retrospective analysis of honey bee exposure and effects data to better target testing needs for pesticides and to address uncertainties regarding the extent to which honey bees are suitable surrogates for both exposure and effects to honey bees and other species of bees (referred to as non-*Apis* bees)

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Non-*Apis* Bee Testing

- **Non-*Apis* bee exposure workshop in 2017 (academia; government; industry.**
- **EPA is continuing to rely on honey bees as a surrogate for non-*Apis* bees; however, when available, data on non-*Apis* bees are considered on a case-by-case basis to determine the extent to which honey bees are not suitable surrogates.**
  - Data on non-*Apis* bees used qualitatively to characterize potential hazard to non-target organisms.
  - Quality of the non-*Apis* bee studies considered using the same standards as those applied to other taxa.
- **EPA clarified position on non-*Apis* bees in response to GAO recommendations.**

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MITIGATING RISKS

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Varroacide Testing

EPA and USDA have been working with the Honey Bee Health Coalition to identify potential varroacides;

- Match grant funded through the Foundation for Food and Agricultural Research;
- Consortium of Land Grant Universities, USDA, University of València (Spain).
- Land Grant University testing new formulation of oxalic acid-saturated towels.

- **EPA is monitoring research efforts to evaluate potential varroacides and understand mechanisms of resistance to these products.**

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Best Management Practices

- OPP has worked directly with the California Almond Board in the development of their BMPs.
- OPP serves as an *ex officio* member of the Honey Bee Health Coalition (HBHC) Steering Committee and has worked with the Coalition on the multiple projects intended to increase communication, cooperation and collaboration between beekeepers, growers and applicators; projects include commodity-specific BMPs; includes BMPs for beekeepers.
- OPP has worked with the Pollinator Partnership's North American Pollinator Protection Campaign (NAPPC) and the HBHC on the development of certified pesticide application training materials for continuing education credits.

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Stakeholder Outreach

- **OPP posted responses to frequently asked questions (FAQs; https://www.epa.gov/pesticides/new-frequently-asked-questions-honeybee-toxicity-testing-registrants-and-contract) regarding the conduct of bee exposure and effects studies.**

- **The FAQs are intended to better ensure that the studies will have utility to EPA.**

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Reducing use of products toxic to bees in crops with commercial pollination

EPA's Policy to Mitigate the Acute Risk to Bees from Pesticide Products issued January 12, 2017

- Two Mitigation Strategies
  - Label restrictions for contract pollination services;
    - Prohibits pesticide applications when bees are brought onsite under contracted pollination services; and,
    - Also provides some flexibility for growers in some circumstances.
  - Managed Pollinator Protection Plans (MP3; includes colonies not under contracted pollination services).
    - Intended to increase communication between stakeholders to reduce exposure of honey bee colonies to pesticides;
    - May include additional measures to reduce exposure and enhance habitat for non-Apis bees and other pollinators.

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State and Tribal Pollinator Protection Plans for Bee Colonies Not Under Contract Pollination Services

EPA continues to encourage development of Managed Pollinator Protection Plans (MP3) and Pollinator Protection Plans (P3s) for States and Tribes.

States have engaged stakeholders (growers, applicators and beekeepers)

- Most (48) states have finalized, are still developing, or intend to develop a plan;
- The majority of plans are voluntary.

Tribal Nations working with the Tribal Pesticide Program Council (TPPC) to develop Pollinator Protection Plans (P3s) with a focus on native pollinators

- At least 10 tribes have or will be developing plans.

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Evaluating the Effectiveness of Managed Pollinator Protection Plans (MP3s)

- **Pesticide Program Dialogue Committee (PPDC) recommended development of a survey instrument.**
  - In cooperation with the Pesticide Program Dialogue Committee, state lead agencies assisted in development of a survey; recommendations were provided to EPA on the use of the survey as a means of evaluating the effectiveness of managed pollinator protection plans.
  - Survey questions include measures of communication, development of best management practices (BMPs)/standard operating procedures (SOPs); education/outreach; stakeholder engagement; and, measures of behavior change/progress.
- **In December 2018, the Inspector General initiated an evaluation of EPA's oversight of MP3s.**

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Recent Label Mitigation and Path Forward

- **Neonicotinoid registrants and some others, voluntarily included at-bloom application restrictions for pollinator attractive crops on labels.**
- **Current re-evaluation for active ingredients with potential pollinator risk, including the neonicotinoids:**
  - Will establish risk mitigation on labels where appropriate and in consideration of benefits; and,
  - Includes stewardship component highlighting work by both private and public entities to promote pollinator health.

Neonicotinoid Bee Risk Assessments

- Neonicotinoids (imidacloprid, clothianidin, thiamethoxam, and dinotefuran) are systemic insecticides which act on the central nervous system by interfering with nicotinic acetylcholine receptors.
- Wide range of agricultural and non-agricultural uses.
- Seed treatment, foliar, and soil application methods.
- High benefits associated with some crops (*e.g.,* citrus, cotton).
- Bee risk assessment is specific to application method, chemical and crop.
- Risk assessed from direct contact and oral ingestion (pollen, nectar).

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Neonicotinoid Bee Risk Assessment

- Preliminary risk assessments (PRA) published in 2016 & 2017;
- 1,000,000+ public comments;
- Hundreds of effects and exposure studies evaluated.
- Additional data since PRA:
  - Effects (long-term colony feeding studies that include overwintering); and,
  - Exposure (residue studies in pollen & nectar).
- Final risk assessments currently under development/review;
- Risk depends on crop, attractiveness to bees, method of application, timing of application;
- Proposed Interim Decision and benefits assessments expected in FY2019.

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Neonic Activities from International Regulatory Agencies

PMRA:

- Preliminary pollinator assessments: indicated a 5-year phase out of all outdoor uses of imidacloprid (based primarily on aquatic risks).
- Recently published final pollinator for assessment for imidacloprid: targets specific app methods and timing on certain use patterns.
- Recently published proposed re-evaluation decision for clothianidin and thiamethoxam: phase out application methods and timing on certain use patterns.
- Minimal risk concluded for seed treatment relative to foliar and soil applications.

EFSA:

- Foliar/soil uses: Prohibited for crops attractive to bees except in greenhouses.
- Seed treatments, oral route (pollen/nectar): Low risk (imidacloprid and clothianidin); and, Inconclusive (thiamethoxam).
- Seed treatments, dust off: High risk

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Preliminary pollinator assessments for imidacloprid, clothianidin, and thiamethoxam previously published (dinotefuran not registered).

ADDITIONAL INFORMATION

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Model Development

- **EPA and USDA collaborated to develop pesticide module for VarroaPOP colony simulation model.**
- **EPA R5 funded a Regionally Administered Research Effort (RARE) grant examining the extent to which fugitive dust can affect bee colonies;**
  - Involves EPA ORD, researchers at Ohio State University, and Ohio corn growers. Data from this project are being used by OPP and ORD to validate the honey bee colony simulation model VarroaPOP in collaboration with USDA.
- **EPA R1 RARE grant examining pesticide use in ornamental horticulture;**
  - ORD is working with the Connecticut Ag Experiment Station to examine effects of acetamiprid use in shade houses on honey bees and bumble bees. The work provides insight into the use of bumble bee microcolonies as a means of assessing effects on managed non-*Apis* bees.

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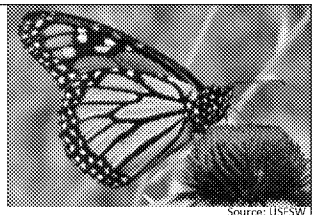
Monarchs


Source: USFSW

- **August 2014– petition to list monarch butterfly.**
- **December 2014– USFWS 90-day determination that species status assessment (SSA) warranted.**
- **June 2019– estimated completion date for SSA;**
  - Identifies species need (individual and population level)
  - Information on current status
    - Threats and stressors
    - Conservation efforts
  - Project future status
  - Potential Outcomes
    - Listing warranted (either as threatened or endangered; possible identification of critical habitat;
    - Listing not warranted; ESA process ends; or,
    - Listing warranted but precluded by species of higher priority; delay listing; consider additional information.

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